

Process Developed for Forming Urethane Ice Models

A new process for forming ice shapes on an aircraft wing was developed at the NASA Lewis Research Center. The innovative concept was formed by Lewis' Icing Research Tunnel (IRT) team, and the hardware was manufactured by Lewis' Manufacturing Engineering Division. This work was completed to increase our understanding of the stability and control of aircraft during icing conditions. This project will also enhance our evaluation of true aerodynamic wind tunnel effects on aircraft. In addition, it can be used as a design tool for evaluating ice protection systems.

Previously, the lost bee's wax method was used to fabricate ice models on aircraft wing sections. This method involved making a beeswax mold and filling it with plaster to form the ice models. After the plaster dried, the beeswax was melted off the plaster ice mold.

This ice modeling process has several disadvantages:

1. During fabrication, some definition of the ice model is lost because of handling.
2. The models tend to be brittle and break off easily because they are made of plaster
3. Only one model can be fabricated at a time.

Lewis' new procedure for forming urethane ice models solves all these drawbacks. With this new process, no definition is lost, the models are much more durable, and mass production is readily available.

For urethane ice models, a hard room-temperature vulcanizing (RTV) silicone rubber mold is formed of an actual ice shape in the Icing Research Tunnel. Then, an exact model is made of the wing shape that the ice came from, and a plywood box is constructed to contain both the hard RTV silicone rubber and wing shape. Release agents are applied to the hard rubber mold and wing shapes, and a two-part urethane casting material is poured into the mold to create the actual ice shape. Since the original hard rubber mold (RTV 3110) is destroyed when the cured urethane ice shape is removed, a softer, more pliable silicone rubber mold (RTV 1000A&B) must be formed around the urethane cast of the ice shape. After the pliable rubber mold solidifies, an unlimited number of identical ice shapes can be cast.



Left to right: Urethane ice model, wing shape model, and pliable silicone rubber RTV 1000A&B mold.

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